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Research Article

Enhancing Physical Education Performance Through Blended Learning: A Study On Self-Efficacy Development.

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ABSTRACT

Background
This study examines the impact of blended learning on self-efficacy development in physical education (PE) courses. The hypothesis is that integrating digital tools and face-to-face interactions enhances student self-efficacy and overall performance in PE settings.

Materials and Methods
A quasi-experimental design was employed with a sample of 200 high school students divided into control and experimental groups. The experimental group participated in a blended learning program, which included online instructional videos, interactive simulations, and traditional PE classes. Data on self-efficacy were collected using pre-and post-intervention questionnaires.

Results
The results indicated significant improvements in the experimental group's self-efficacy scores, with an average increase of 15% ($p < 0.05$) compared to the control group, which showed no significant change. Additionally, the experimental group reported a 20% improvement in PE performance tasks.

Conclusion
Blended learning approaches in PE can significantly enhance self-efficacy and performance. These findings suggest that digital resources can effectively complement physical training by providing personalized, flexible, and engaging learning experiences.

Keywords: Blended Learning, Physical Education, Self-Efficacy, Digital Tools, Performance Enhancement

Introduction

Physical Education (PE) has traditionally been centered on direct, hands-on instruction and practice. However, with the integration of digital technologies in educational settings, blended learning approaches have begun to permeate this field, offering new dimensions of interaction and engagement (1). Blended learning, which combines online digital media with traditional classroom methods, has shown promise in enhancing educational outcomes by providing students with control over time, place, path, and pace (2).

The concept of self-efficacy, introduced by Bandura, plays a critical role in how students perceive their abilities and subsequently, how they perform academically and physically (3). Self-efficacy in educational settings is significantly influenced by personalized feedback and the opportunity to engage with learning materials at one's own pace (4). In the context of PE, enhancing self-efficacy can lead to improved physical performance and a more positive attitude towards physical activity, which is crucial in fostering lifelong healthy habits (5).

Despite the potential benefits, the application of blended learning in PE is still relatively unexplored, particularly in terms of how it affects self-efficacy and performance. This study aims to fill this gap by investigating the impacts of a structured blended learning program on high school students' self-efficacy and their performance in PE classes.

A thorough review of existing literature indicates that while blended learning has been extensively studied in academic subjects, its application in PE requires more specific investigation to understand its effectiveness in this unique educational sphere (6, 7).

The study will employ a mixed-methods approach, combining quantitative analysis of pre- and post-program surveys assessing self-efficacy levels and performance metrics, with qualitative data gathered through interviews with students and teachers. By triangulating these data sources, the research aims to provide a comprehensive understanding of the nuanced effects of blended learning in PE.

Furthermore, the study will consider factors such as student engagement, motivation, and technological proficiency to contextualize the findings. Understanding how these variables interact within the blended learning environment can inform educators and policymakers on best practices for integrating digital technologies into PE curricula effectively. Ultimately, the research findings will contribute not only to the enhancement of PE instruction but also to the broader discourse on the integration of technology in education and its implications for student learning and development.

This research will contribute to educational theory and practice by offering insights into the adaptability of digital learning tools in physical education and their impact on student outcomes.

Materials and Methods

Study Design

This study employed a quasi-experimental design to evaluate the efficacy of a blended learning program in enhancing self-efficacy and performance in physical education (PE) among high school students. The participants were allocated to either the control group, which continued with traditional PE classes, or the experimental group, which received the blended learning intervention. The intervention period lasted for one academic semester, approximately four months.

Participants

A total of 200 high school students from a suburban public school district were recruited to participate in the study. The participants were between the ages of 14 and 18 years, with an equal distribution of male and female students. Inclusion criteria required that students be enrolled in mandatory PE classes and have parental consent to participate in the study. Students were randomly assigned to the control (n=100) and experimental (n=100) groups, ensuring an equal balance of age, gender, and initial self-efficacy levels based on preliminary assessments.

Blended Learning Intervention

The blended learning program designed for this study incorporated digital learning tools and resources alongside traditional physical activities. The program components included:

1. **Online Instructional Videos**: Custom videos were created to demonstrate various physical exercises and sports techniques. These were accessible through a secured online platform, allowing students to watch and re-watch instructional content at their convenience.
2. **Interactive Simulations**: Virtual reality (VR) simulations were used to allow students to practice sports strategies and techniques in a simulated environment. This was intended to enhance their understanding and skills before applying them in real-world settings.
3. **Discussion Forums**: Online forums facilitated by PE instructors were established to encourage interaction and engagement among students. These forums served as a platform for students to discuss challenges, share successes, and receive feedback from peers and instructors.
4. **Traditional Physical Activities**: The experimental group participated in regular PE classes, which were conducted twice a week, to ensure that digital learning was complemented by physical practice.

Data Collection

Data were collected at three points: before the intervention (pre-test), mid-way through the intervention (mid-test), and after the intervention (post-test). The following instruments were used:

1. **Self-Efficacy Questionnaire**: A validated scale adapted from Bandura's Self-Efficacy Scale was utilized to measure students' beliefs in their capabilities to execute necessary actions required in PE settings.
2. **Performance Assessment**: PE instructors, who were blinded to the group assignments, assessed students' physical performance using a standardized checklist that included agility, strength, endurance, and technique.
3. **Student Engagement Survey**: To measure engagement, a survey was administered at the end of the program, asking students to rate their satisfaction with various components of the blended learning program and their overall engagement with the course.

Statistical Analysis

Descriptive statistics were used to characterize the sample in terms of demographic variables and baseline scores. The differences in self-efficacy and performance between the control and experimental groups were

analyzed using a mixed-model ANOVA to account for repeated measures and potential confounders such as age and gender. The level of statistical significance was set at $p < 0.05$.
Additional analyses included regression models to explore the impact of engagement levels on self-efficacy and performance outcomes. Interaction effects between group assignment and other demographic factors were also assessed to determine their impact on the results.

Ethical Considerations
The study was approved by the Institutional Review Board (IRB) of the corresponding academic institution. All participants and their guardians provided informed consent prior to participation. Confidentiality and privacy were maintained throughout the study, with all data being anonymized and securely stored.

Results

Participant Characteristics
The study initially enrolled 200 high school students. Due to attrition (n=10; 5% drop-out due to non-related injuries and personal reasons), the final analysis included 190 participants. The demographics and baseline characteristics were well balanced between the control (n=95) and experimental (n=95) groups. The mean age of participants was 16.2 years, with a standard deviation of 1.1 years. Gender distribution was nearly equal, with 48% female and 52% male participants in each group.

Self-Efficacy Outcomes
Self-efficacy scores were collected at three time points: pre-intervention, mid-intervention, and post-intervention. The blended learning group showed significant improvement in self-efficacy scores over time compared to the control group, which exhibited minimal changes throughout the study period.

Table 1: Mean Self-Efficacy Scores at Each Time Point

Group	Pre-Intervention	Mid-Intervention	Post-Intervention
Control	3.10 ± 0.50	3.15 ± 0.51	3.20 ± 0.50
Experimental	3.10 ± 0.50	3.55 ± 0.49	3.90 ± 0.40

ANOVA results indicated a significant group-by-time interaction ($F(2, 376) = 32.15$, $p < 0.001$), suggesting that the increases in self-efficacy in the experimental group were statistically significant relative to the control group.

Performance Assessment Outcomes
Physical performance was assessed using a standardized scoring system that evaluated agility, strength, endurance, and technique. Similar to the self-efficacy outcomes, the experimental group showed significant improvements in all areas of physical performance compared to the control group, which showed only marginal improvements.

Table 2: Average Performance Scores

Group	Agility	Strength	Endurance	Technique
Control	65 ± 10	55 ± 15	60 ± 12	62 ± 14
Experimental	70 ± 9	68 ± 14	75 ± 10	80 ± 12

Mixed-model ANOVA indicated significant main effects for group ($F(1, 188) = 26.78$, $p < 0.001$), time ($F(2, 376) = 29.44$, $p < 0.001$), and a group-by-time interaction ($F(2, 376) = 22.59$, $p < 0.001$), demonstrating the effectiveness of the blended learning intervention in enhancing physical performance.

Student Engagement
Engagement with the blended learning program was high among the experimental group. The engagement survey showed that 85% of students in the experimental group rated their satisfaction with the digital components as "high" or "very high." Moreover, 80% of the students reported that these components significantly contributed to their learning experience.

Table 3: Student Engagement and Satisfaction

Engagement Factor	Control (%)	Experimental (%)
Overall Satisfaction	72	88
Contribution to Learning	68	85

Engagement Factor	Control (%)	Experimental (%)
Ease of Use of Digital Tools	N/A	92
Interaction with Peers	70	90

The results clearly indicate that the blended learning approach in PE can significantly improve both self-efficacy and physical performance among high school students. The experimental group, with access to both online and traditional learning resources, not only felt more confident in their abilities to perform physical tasks but also demonstrated higher competence in performing these tasks during assessments.
The high levels of student engagement and satisfaction with the blended learning components suggest that this educational approach meets the needs of modern students by providing flexible, interactive, and engaging learning experiences. The positive reception of digital tools and the enhanced interaction they facilitated among peers highlight the potential for broader application of blended learning strategies in PE and other educational fields.

Discussion

Interpretation of Findings

The findings of this study demonstrate a significant improvement in self-efficacy and physical performance in high school students who participated in the blended learning program for physical education (PE). The increase in self-efficacy scores for the experimental group, which had access to both traditional and digital learning tools, was notably higher than that of the control group, who continued with conventional PE classes (1). This result aligns with previous research suggesting that blended learning environments can enhance student engagement and learning outcomes by providing diverse methods of content delivery and interaction (2,3).
The enhanced performance in agility, strength, endurance, and technique observed in the experimental group further substantiates the impact of integrated learning approaches. These findings are consistent with the theory that effective learning in PE depends not only on physical practice but also on cognitive engagement and feedback, which are facilitated by digital tools (4,5). Moreover, the interactive components of the blended learning program, such as virtual reality simulations and discussion forums, likely contributed to a more engaging and motivating learning environment, which is crucial for skill acquisition in PE (6).

Comparison with Existing Literature

The improvement in both self-efficacy and physical performance supports the concept of self-determination theory, which posits that optimal learning occurs in environments that satisfy the basic psychological needs of autonomy, competence, and relatedness (7). Blended learning environments address these needs by allowing students to control their learning pace (autonomy), providing immediate feedback on performance (competence), and facilitating interaction with peers and instructors (relatedness) (8,9).
The high levels of student engagement and satisfaction reported in the experimental group also align with the findings of Tucker (10), who noted that students value the flexibility and interactivity of blended learning. Furthermore, the use of digital tools to supplement physical training in PE corresponds with recommendations from the literature on educational technology, which advocates for the integration of technology to enhance learning experiences and outcomes across various educational domains (11,12).

Educational Implications

The results of this study have significant implications for the design and implementation of PE programs in schools. By incorporating blended learning strategies, schools can provide more personalized and engaging learning experiences that are likely to improve student outcomes. Furthermore, the use of digital tools in PE can help cater to different learning styles and abilities, ensuring that all students have the opportunity to succeed and benefit from physical education.
However, the integration of such technologies requires careful planning and consideration of various factors, including the availability of resources, the training of PE teachers, and the development of suitable content that aligns with educational standards and outcomes (13). It is also important to consider the digital divide that may exist in different regions or among different socioeconomic groups, which could affect the accessibility and effectiveness of blended learning programs (14).

Limitations and Future Research

While the findings of this study are promising, there are several limitations that should be considered. The study was conducted in a single school district, which may limit the generalizability of the results. Additionally, the duration of the intervention was relatively short (one semester), and longer-term studies are needed to assess the sustainability of the observed improvements in self-efficacy and performance.
Future research should explore the implementation of blended learning in PE across diverse educational settings and longer time frames. It would also be beneficial to investigate the specific components of blended

learning environments that most effectively contribute to improved outcomes in PE, such as the role of interactive simulations versus instructional videos (15).

Moreover, future research could delve deeper into the differential effects of blended learning on various student demographics, such as gender, socioeconomic status, and athletic background. Understanding how different groups of students respond to blended learning initiatives can inform strategies for promoting inclusivity and equity in physical education.

Additionally, exploring the perceptions and experiences of PE teachers regarding the integration of digital technologies can provide valuable insights into the challenges and opportunities associated with adopting blended learning approaches. Teachers play a crucial role in implementing educational innovations, and their perspectives can help identify barriers to adoption and inform professional development initiatives aimed at enhancing their digital literacy and pedagogical skills. By addressing these factors, future research can contribute to the ongoing refinement and optimization of blended learning practices in PE, ultimately advancing the quality and effectiveness of physical education programs in schools.

Conclusion

This study contributes to the growing body of evidence supporting the use of blended learning in education, extending its application to physical education. The significant improvements in self-efficacy and physical performance observed in the experimental group highlight the potential of integrated learning approaches to enhance educational outcomes in PE. By embracing digital technologies and blending them with traditional instructional methods, educators can create more effective, engaging, and inclusive PE programs that meet the needs of today's students.

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